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Non-reusable retractable needle syringe

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ABSTRACT

A non-reusable retractable needle syringe is disclosed. The device comprises separate twin elongated cylindrical chambers, one for the injectable fluid and hollow plunger, the other to accommodate the retractable needle mechanism. The hollow plunger and an associated seal member slides over the inner cylindrical chamber that houses the non-reusable retractable needle mechanism. Before use, interlocking tabs prevent the plunger from being pressed down and prematurely triggering needle retraction. Hence, only when the plunger is drawn back to suck up injectable fluid do the interlocking tabs spring outwards and allow the plunger to be pressed to the bottom of the syringe setting off the triggering mechanism which retracts the needle.

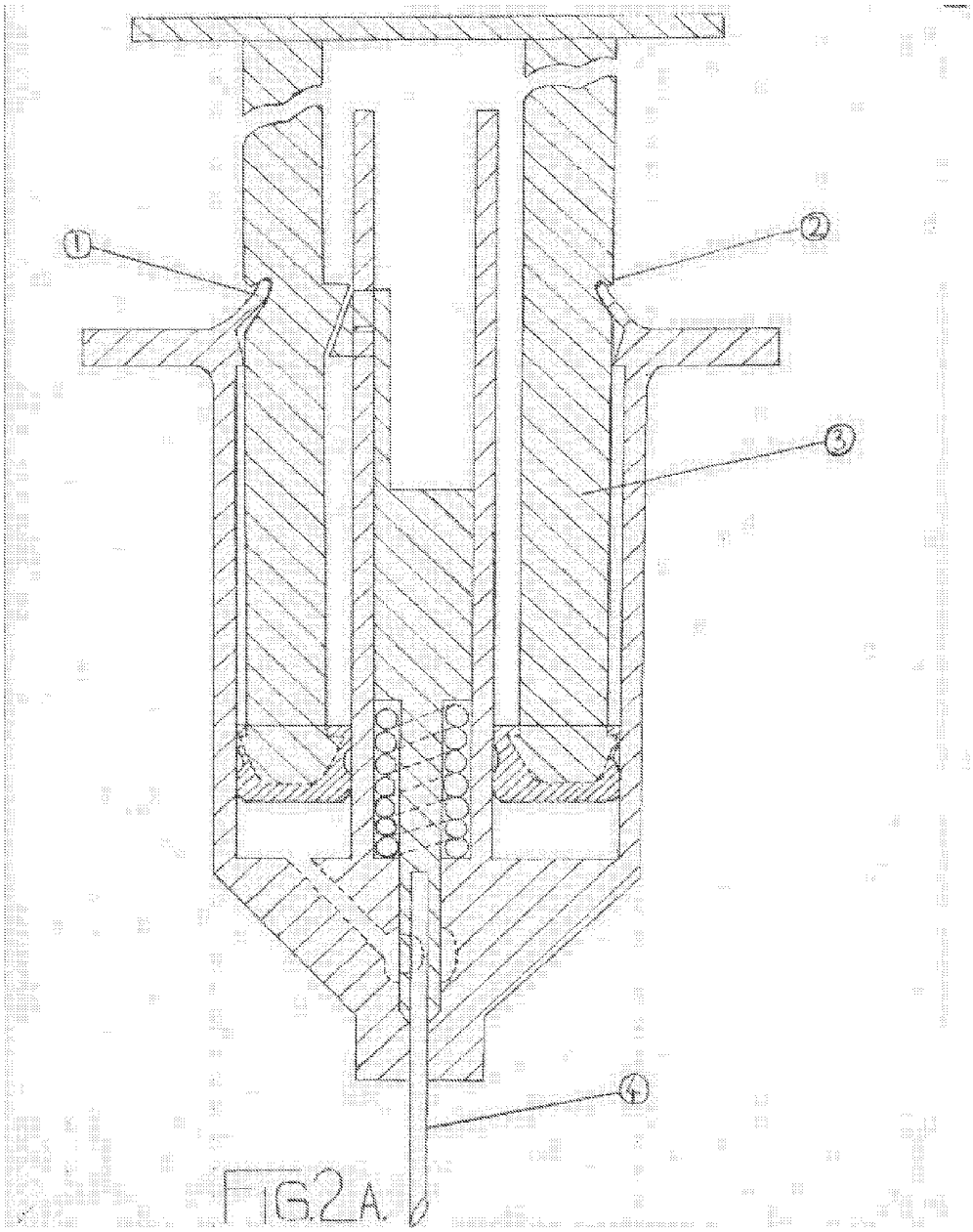

FIG.2A

AUSTRALIA

Patents Acts 1990

COMPLETE SPECIFICATION
INNOVATION PATENT

NON-REUSABLE RETRACTABLE NEEDLE SYRINGE

The following statement is a full description of this invention, including the best method of performing it known to me:

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NON-REUSABLE RETRACTABLE NEEDLE SYRINGE
This invention relates to improvements in non-reusable retractable needle syringes for the purpose of preventing the acquisition of blood related contagious diseases through needle-stick injuries by health professionals, drug users and the general public.

There have been many proposals for non-reusable retractable needle syringes, but these have all required that the syringe maintains a seal member which slides inside a single cylindrical plastic body. That is, the end of the plunger (seal member) that is usually made from an elasticised rubber material, which seals and contains the injectable fluid, slides inside a single cylindrical barrel-like body.

The problem with then using the existing one-piece plunger for retractable needle syringes is that the overall length of the syringe may have to be extended to allow for the retracting needle mechanism. Hollow plunger syringes eliminate the problems associated with excessive overall length in a retractable needle syringe by having the needle retract inside the actual plunger. This aids compaction and also leads to a decreased risk from tampering with the device as the needle is housed within the heart of the syringe.

ClipOn(r) retractable needles which can be used to modify existing syringes, rely on manually retracting the needle after use. While being a benefit to conscientious health professionals, they still pose risks for use by drug addicts who may not retract the needle or the ClipOn(r) needle may come off, posing another risk of leakage of contaminated injectable fluid. There obviously needs to be a compact, safe, easy to manufacture, tamper proof and non-reusable retractable needle syringe to be used by both health professionals and drug addicts. The syringe proposed here aims to fulfil these requirements.

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While hollow plungers have been proposed for non-reusable retractable safety syringes, none have incorporated the innovated step proposed here of actually having a double chambered syringe with a normally sealable hollow plunger that slides over a separate inner cylindrical compartment which has the sole purpose of housing the retracting needle mechanism. And thus the retracting needle mechanism is completely separate from the barrel containing the injectable fluids.

While another proposed hollow plunger syringe incorporates sharp knives to pierce the seal member to allow a needle to retract within, this syringe does not need to use any sharp knives, which only add to cost and complexity in manufacture. The triggering device to retract the needle is contained well within the syringe and thus is safe from tampering. This proposed syringe

also retracts the needle automatically once the hollow rubberised seal member at the end of the plunger is firmly pressed down. Another proposed pneumatic non-reusable retractable needle syringe relies on a gas-filled compartment to be punctured to retract a needle. However the pressure filled compartment may prove too difficult to manufacture and may pose problems in expansion of gases leading to cracks in the syringe during autoclaving which also may pose a problem in failing to adequately retract the needle safely. This proposed non-reusable retractable needle syringe relies on a more proven spring operated mechanism rather than using gas pressure to retract the needle.

This proposed syringe also incorporates outer tabs, which lock the hollow plunger in place before use and prevents the plunger from retracting the needle prematurely. Only when then plunger is pulled back to allow fluid to enter the syringe, does this cause the outer locking tabs to naturally spring outwards, thus allowing the plunger to have full movement downwards and hence cause the tabs on the trigger mechanism to retract the needle.

And only when the seal member of the plunger has been pressed all the way down does the needle retract. This is due to a fixed angular triggering tab on the inside of the hollow plunger moving past and bending back an opposing flexible triggering tab which is joined to the retractable needle housing and normally prevents it from retracting.

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A compression spring causes the needle housing to retract within a separate inner cylindrical sealed chamber that the hollow plunger slides over. Once the needle housing has retracted, its flexible triggering tabs click back over the top of the inner cylindrical chamber and along with the spring prevent the needle from obtruding outside the syringe. The syringe is then effectively made non-reusable and further movement of the hollow plunger will not cause the needle to protrude again outside the syringe.

In one form of the invention, the shaft of the hollow plunger can consist of a solid cylindrical plunger or a plunger made up of sectional elongated ribs (refer to FIG. 1). The triggering mechanism can also consist of a single flexible tab (FIG. 1) or multiple flexible tabs (FIG. 5). The syringe can be designed to accommodate plastic moulded covers at both ends of the syringe to aid in sterility and protection of the needle of the device during storage or handling of the device (refer to figure a).

This proposed syringe consists of few parts, most of which should be manufactured by injection moulding machines from a suitable autoclavable plastic. The spring can be made from either plastic or metal depending on cost and effectiveness in its ability to retract and should also be autoclavable.

Interlocking tabs on the main syringe body can be pressed into the sides of the plunger via a specialised automated machine. The sealable member should be made from a suitable elasticised rubber material. And the flexible triggering tabs connected to the needle housing should be made of thin extruded plastic, which allows for easy bending.

To assist with understanding the invention, reference will now be made to the accompanying drawings, which show an example of the invention.

FIG. 1 shows a schematic representation of this proposed innovative non-reusable retractable needle syringe. Note that for simplicity, this drawing is not to scale and does not include provision for a top cover. To see a modified version of this syringe proposed to incorporate covers refer to FIG. 5.

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Referring to FIG. 1 the overall design can be appreciated. Firstly, note the separate twin cylindrical chambers 4 and 13, that is the distinguishing feature of this proposed syringe. And, also note the fact that the seal member 15 slides around the inner cylindrical chamber 4, which leads to injectable fluid only being drawn up and held in the outer compartment shown in the space at 17. Note that the needle housing and mechanism 8, 11, 14, 18, 21 and 25 are situated in a separate inner elongated cylindrical chamber accommodated at the space referred at 12.

FIG. 1 shows that the top of the hollow plunger 1 is connected to the hollow cylindrical seal member 15 by elongated ribs 5. Note, elongated ribs have been depicted for simplicity, the ribs can be interchanged by a preferred solid cylindrical design, refer to FIG. 4.

Male and female corresponding locking tabs 2 and 7 are shown. Male locking tabs 7 at the top of the outer cylindrical chamber 13 are depicted bent outwards, as the plunger is shown in a retracted position. When the syringe is unused, as in FIG. 2a, tabs 7 are shown to lock into tabs 2.

The inner elongated cylindrical chamber 4 is shown with the needle housing 14 held within. The angular opposing triggering tabs 3 and 8 can be seen. Tab 3 is fixed whilst tab 8 is flexible due to a thin connecting strut 11. The tab 8 fits into a slot 6, which prevents the needle housing 14 from retracting. Tab 8 only bends inwards due to tab 3 sliding past when the seal member 15 has been pressed firmly to the bottom of the syringe 19. And the spring shown at 18 causes the needle housing 14 to retract.

When the plunger is drawn back, injectable fluid passes through the needle 25 and then out of a ground back groove in the needle seen in 21. The fluid then travels up a small hole 22 and exits from an opening shown in 20. The opening 20 should be as close to the inner cylindrical chamber as possible and the hole 22 as short as possible to aid in manufacturing the syringe. The groove 21 does not need to be aligned in any particular position to allow fluid to enter because a circular recess 23 runs around the full circumference of the needle housing.

The rubberised seal member 15 has a groove 16 around its circumference to aid in sealing fluids.

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A circular lip 10 runs around the circumference of the outer cylindrical chamber barrel 13 which prevents the seal member 15 from coming out of the syringe under moderate force.

FIGURES 2a-2e depict cross-sectional views of this proposed syringe and demonstrate the retractable needle mechanism during various stages of intended use.

FIG. 2a shows the syringe in its storage position straight after manufacture. Observe that the male and female interlocking tabs 1 and 2 prevent the hollow plunger 3 from being pressed down any further. Note also that the needle 4 is extended outside the syringe and functional for use.

FIG. 2b shows the stage when the plunger 3 is first retracted and should now be sucking up fluid through needle 4 and transferring the injectable fluid into the main outer storage chamber indicated at 5. Note that the male interlocking tabs at 1 spring back in a new orientation. This occurs due to

the manufacturing process, whereby the tabs at 1 assume their original outward orientation when the syringe is first plastic extruded. The tabs new orientation subsequently allows the plunger 3 to have full movement downwards.

FIG. 2c depicts the hollow plunger 3 in its fully retracted position. Note that a small lip at 6 prevents the hollow plunger from detachment of the syringe or interference with the seal member 7 and the triggering tab at 8.

FIG. 2d shows the stage whereby the hollow plunger 3 has been pressed firmly to the bottom of the syringe. Note that this has resulted with the triggering tab 8 to bend inwards due to an opposing angular projection 9 on the hollow plunger rib 3, moving past it. Remember that adequate space should be provided in the inner chamber 10 to allow for the tab to bend inwards and successfully release the needle housing 11.

FIG. 2e shows the stage whereby the needle housing 11 has been fully retracted by the action of a spring at 12. This takes the needle with it safely inside the inner chamber 10. Note that the triggering tab at 8 is now bent over the top of the inner chamber 10 and along with the spring, prevents the needle from being exposed outside the syringe.

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FIGURES 3a-3d show various stages of the proposed triggering mechanism that causes the needle to retract.

FIG. 3a shows a representation of the proposed opposing angular triggering tabs. The fixed tab on the inside of the hollow plunger is represented at 1 and the flexible tab is at 2, which is part of the needle housing at 3.

FIG. 3b shows the syringes triggering tabs in the storage stage. The flexible tab 2 is shown located inside the inner chamber 4. Note that the slot 5 allows the tab 2 movement upwards.

FIG. 3c shows the stage whereby the flexible tab is pressed inwards.

FIG. 3d shows the bendable tab 2 over the top of the inner chamber 6.

FIGURES 4a and 4b show 2 different proposed hollow plunger designs. FIG. 4a depicts a multiple rib design proposed in FIGURES 1-3. However the preferred design is the solid hollow cylindrical plunger, with inner and outer tabs moulded in the design as seen in FIG. 4b. The solid cylindrical hollow plunger design in FIG. 4b has the advantage of being simpler, stronger and its solid surface prevents the needle from being exposed or falling out of the syringe.

FIG. 5 shows an example of the proposed syringe with the option to incorporate end covers. The one to safely cover the needle during storage and handling is seen at 2. The other cover is for the end of the hollow plunger to aid in sterility seen at 1. This drawing represents an example of this syringe before it is to be used. The proposed covers will be tapered on the inside surface to aid attachment. Notice that multiple triggering tabs at 3 can be seen in this proposed syringe drawing.

The claims defining the invention are as follows:

1. A non-reusable retractable needle syringe, comprising separate twin elongated cylindrical chambers, one for the injectable fluid and a sliding hollow plunger, the other to accommodate the retractable needle and associated holder with a spring release mechanism.

2. The non-reusable retractable needle syringe of claim 1 wherein an end of the hollow cylindrical plunger comprises a hollow functional sealable member that slides over the inner cylindrical chamber that houses the retractable needle mechanism.

3. The non-reusable retractable needle mentioned in claim 1 retracts due to a triggering mechanism that operates when the hollow plunger seal member as mentioned in claim 2, arrives very close to the bottom of the injectable fluid chamber.

4. The triggering mechanism that retracts the needle as mentioned in claim 3 comprises opposing angled tabs, situated on the inside of the hollow plunger that correspond to the retractable needle's associated sliding mechanism and operates by fixed and opposing flexible tabs coming into contact with each other.

5. The hollow plunger and the outer cylindrical chamber of the syringe mentioned in claim 1, are interlocked together before use by male and female tabs which prevent the hollow plunger from prematurely triggering the syringe to retract, hence only when the plunger is drawn back to suck up injectable fluid and then pressed very close to the bottom will the needle retract.

Martin Poljansek 29 December 2001

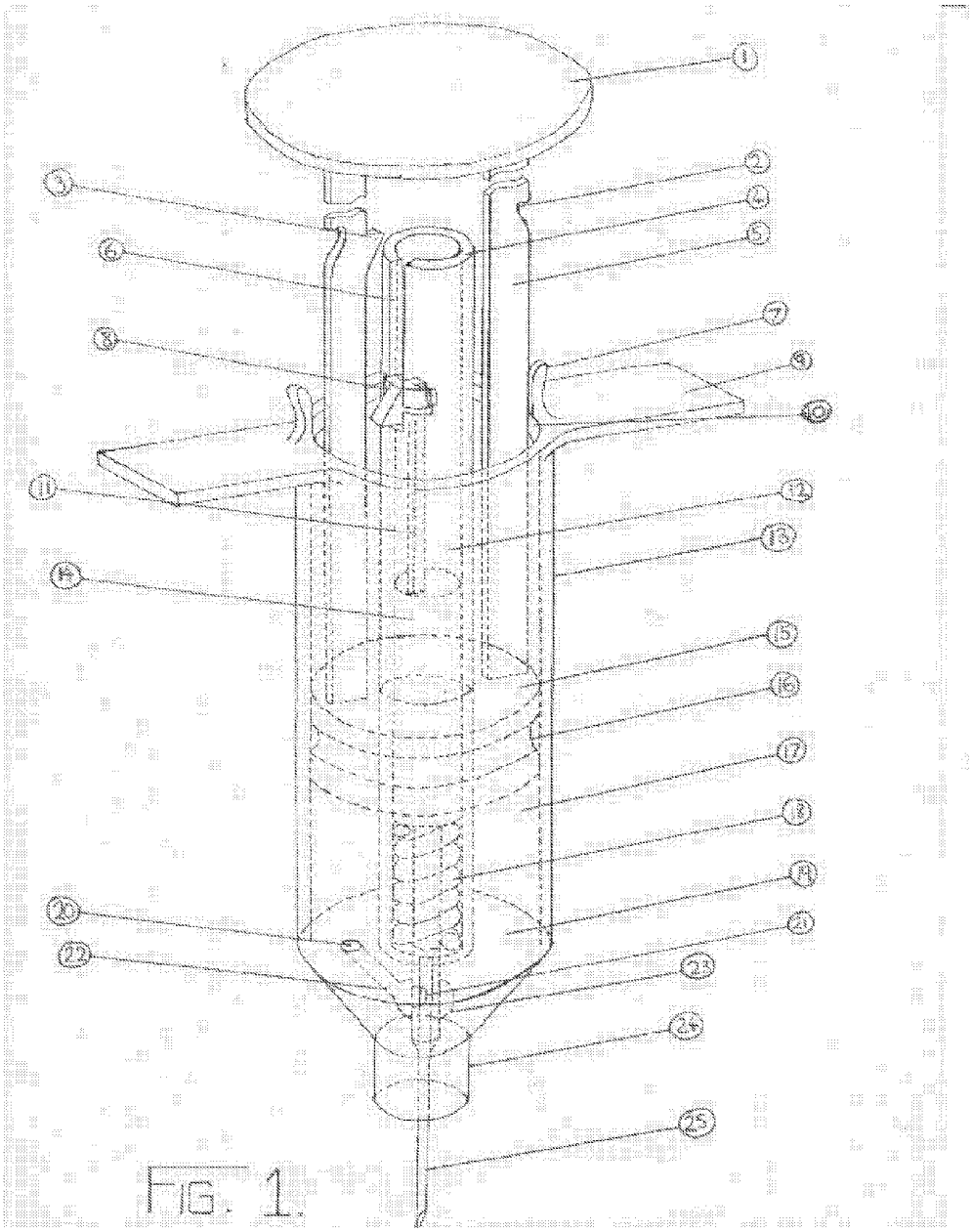

FIG. 1

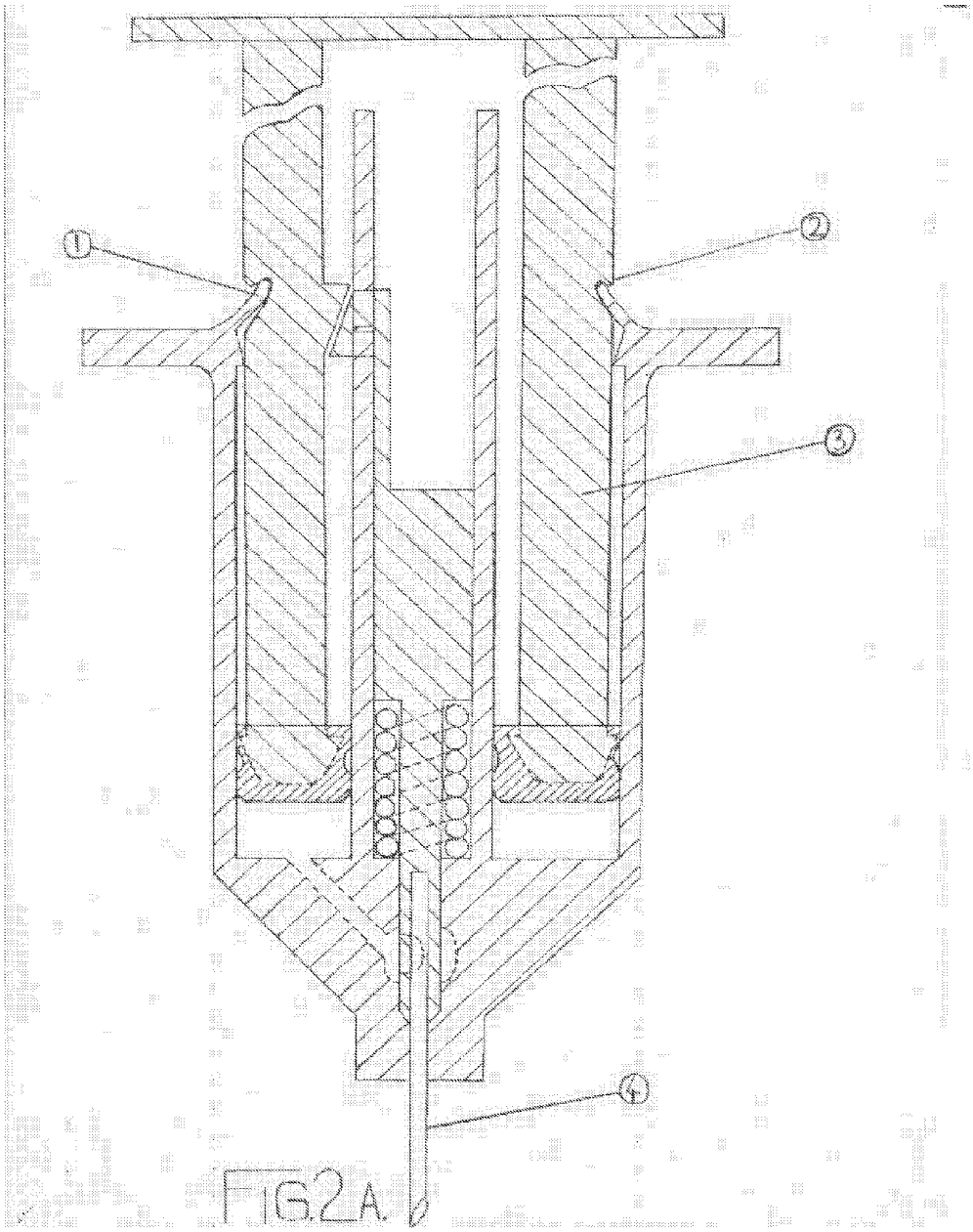

FIG.2A

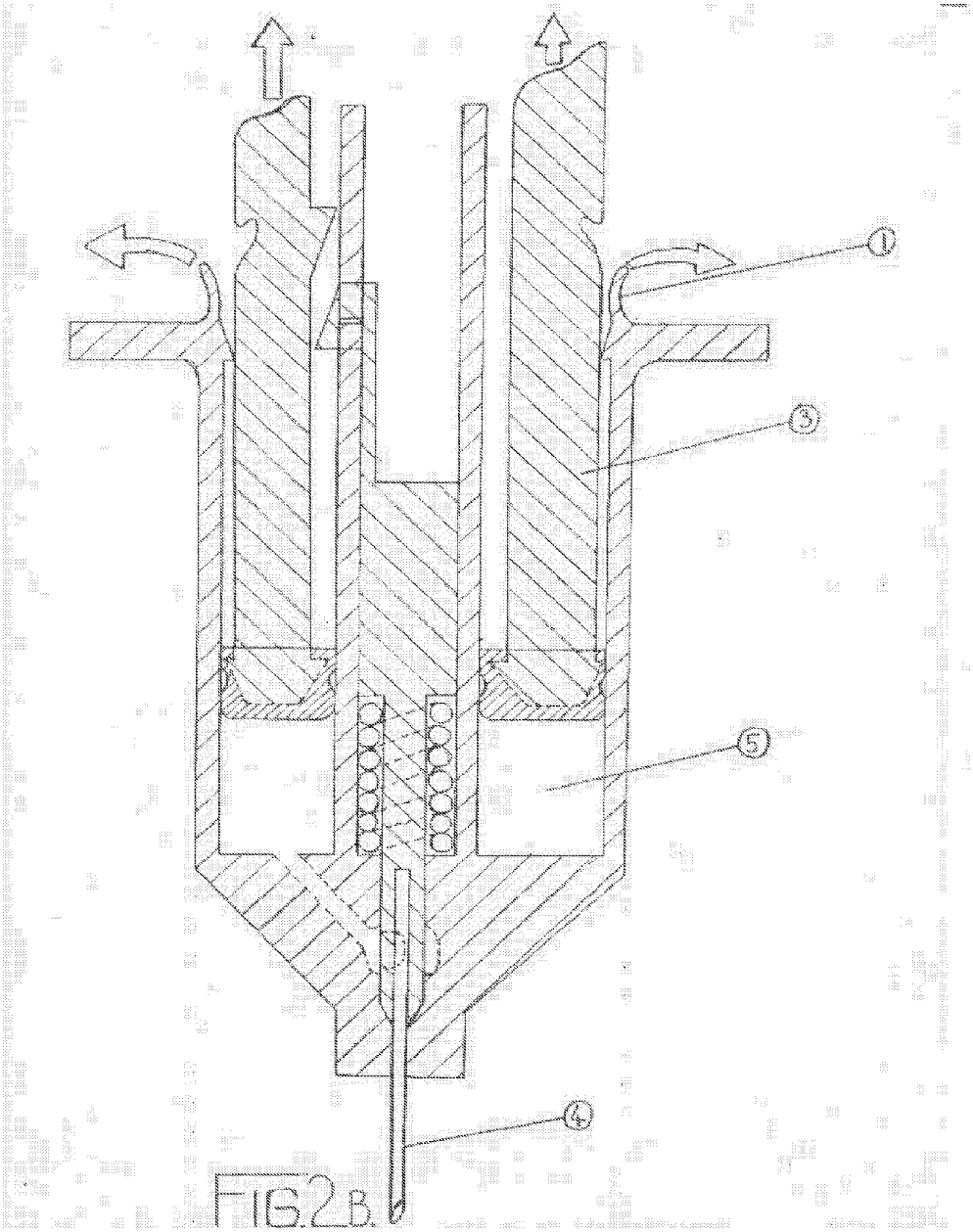

FIG.2B.

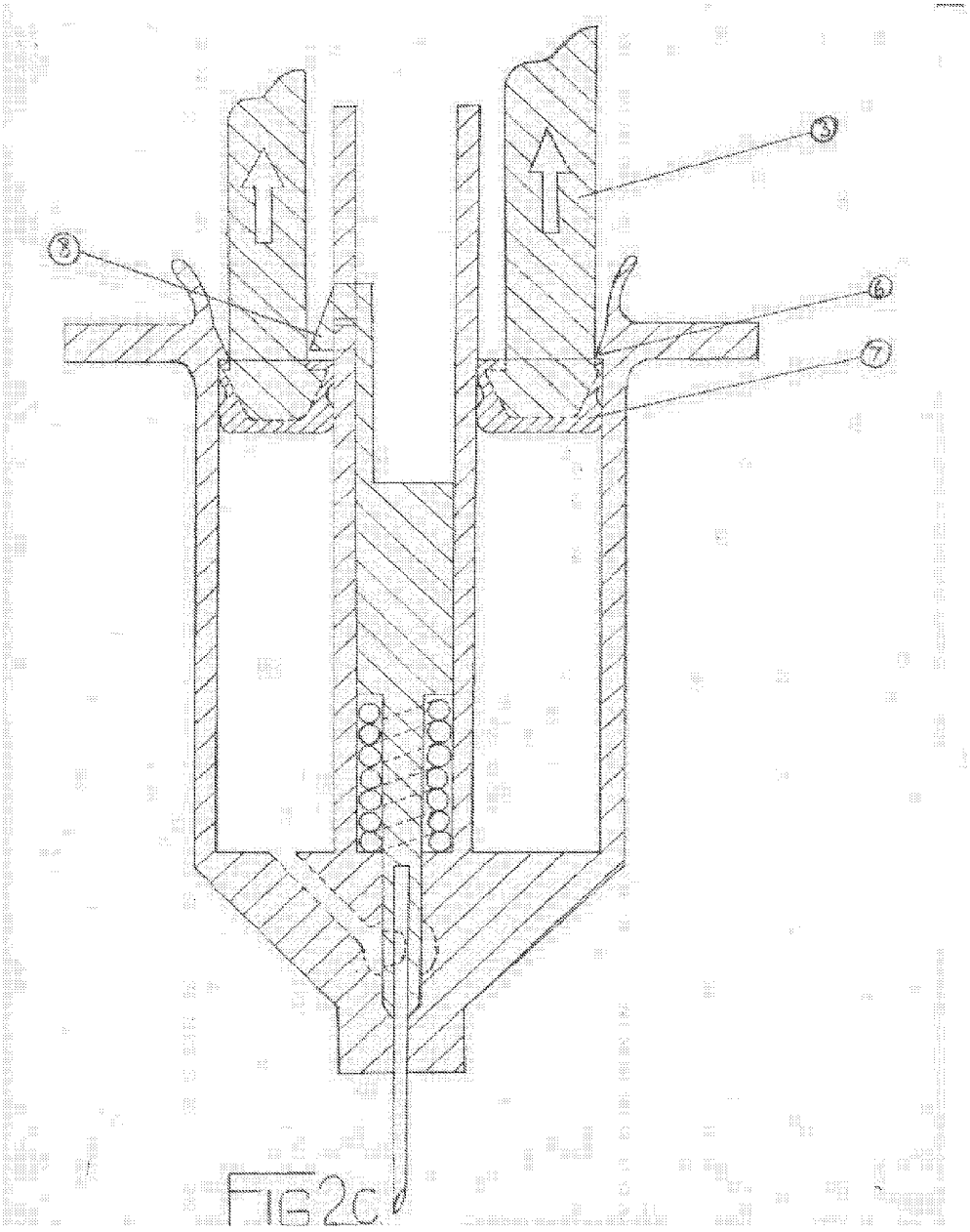

FIG 2C

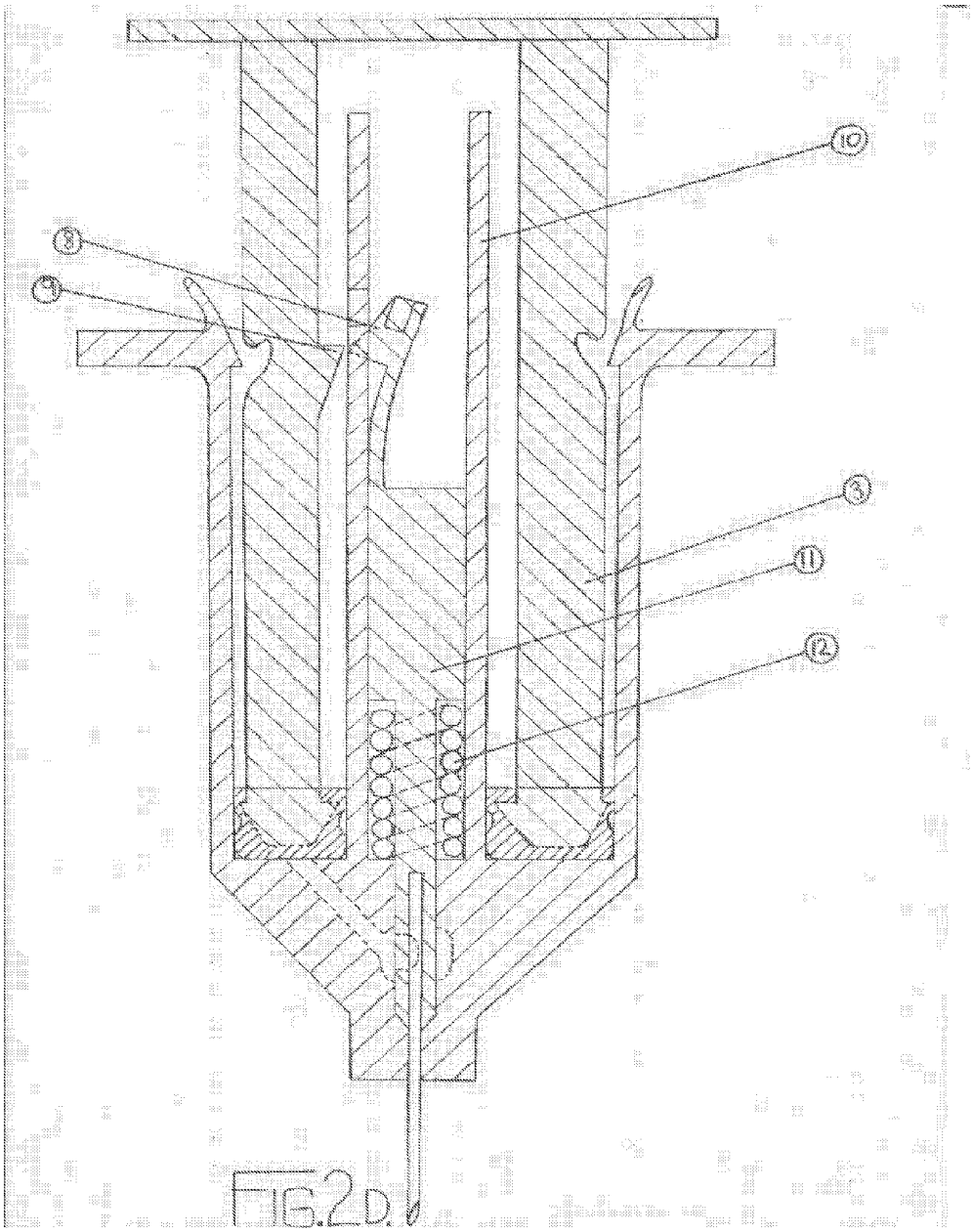

FIG.2D.

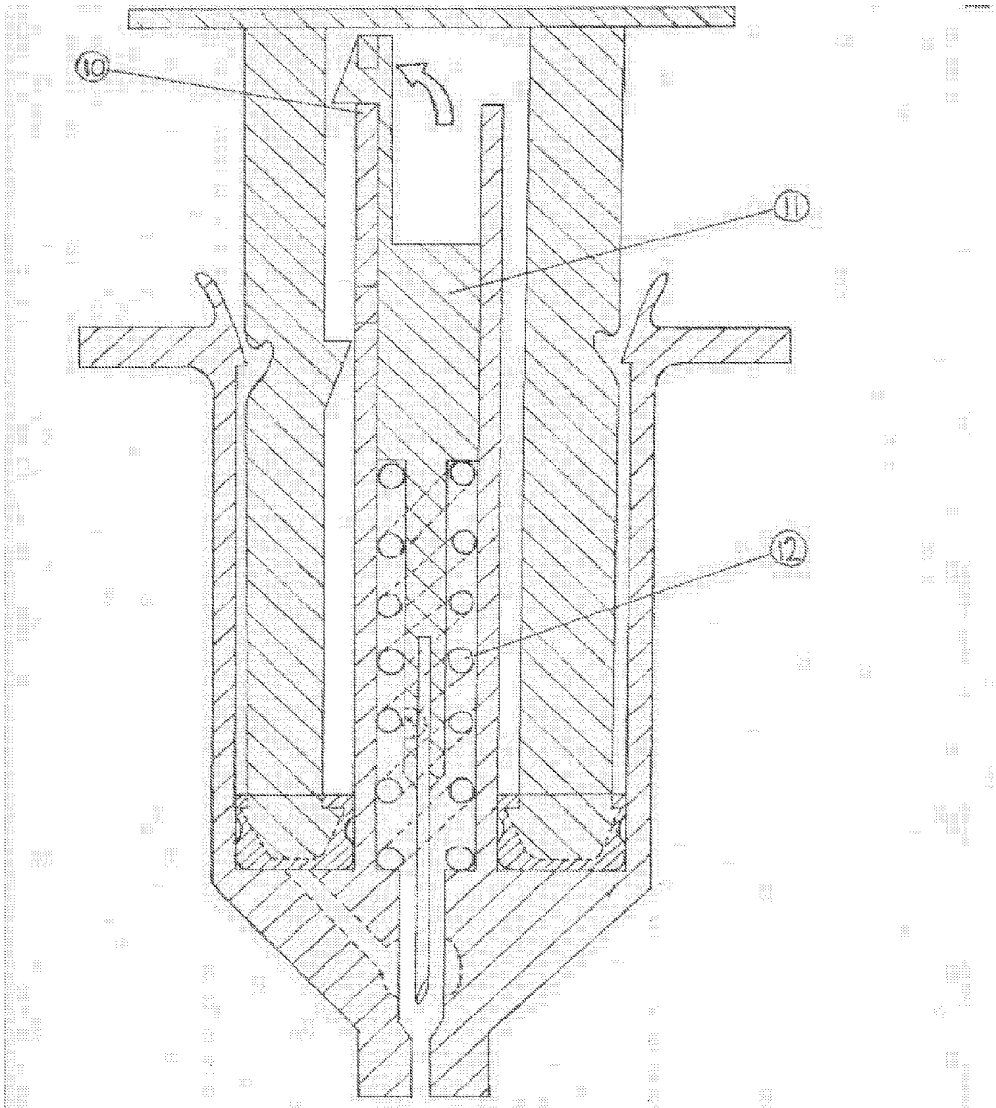

FIG. 2E.

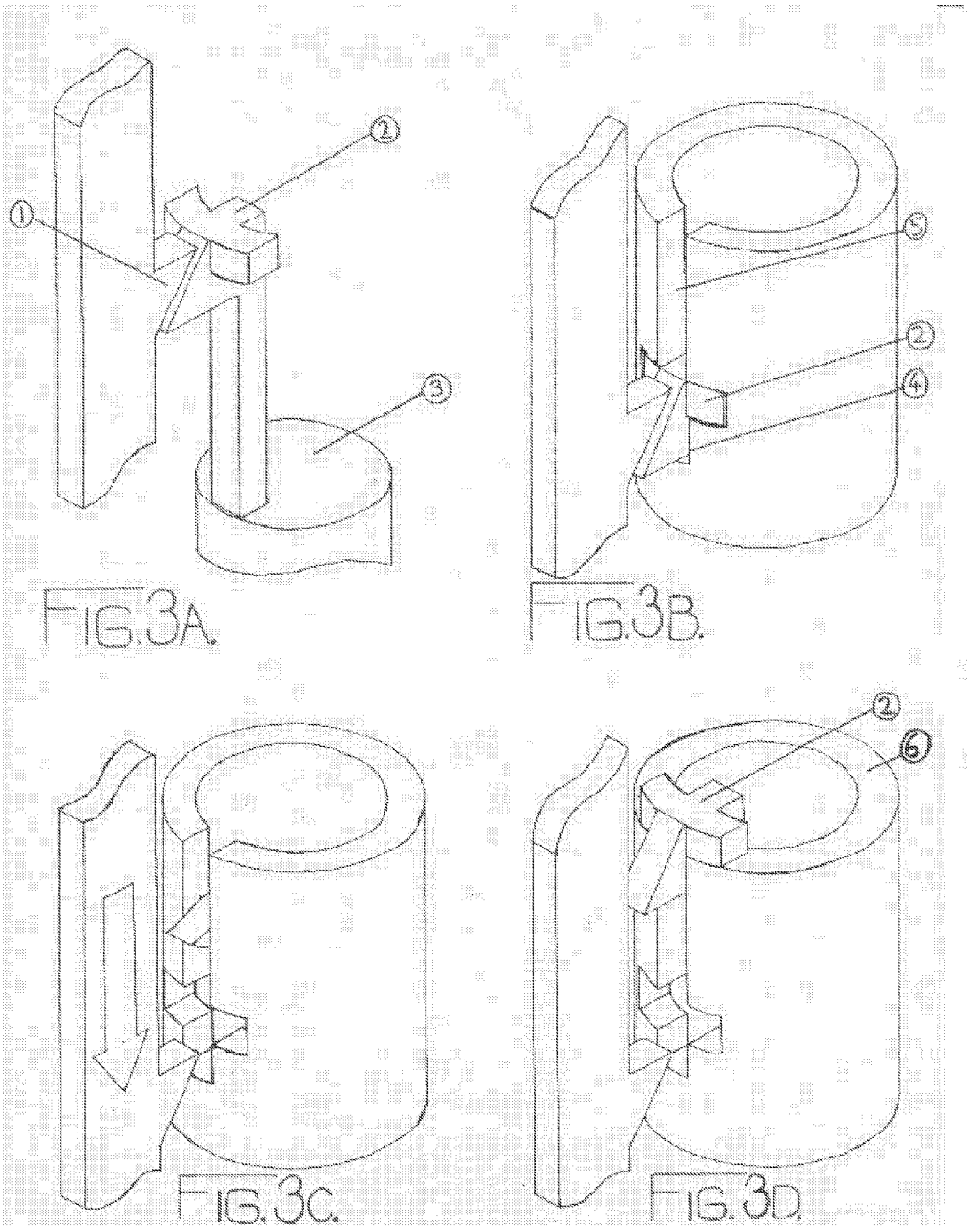

FIG.3A.

FIG.3B.

FIG.3C.

FIG.3D.

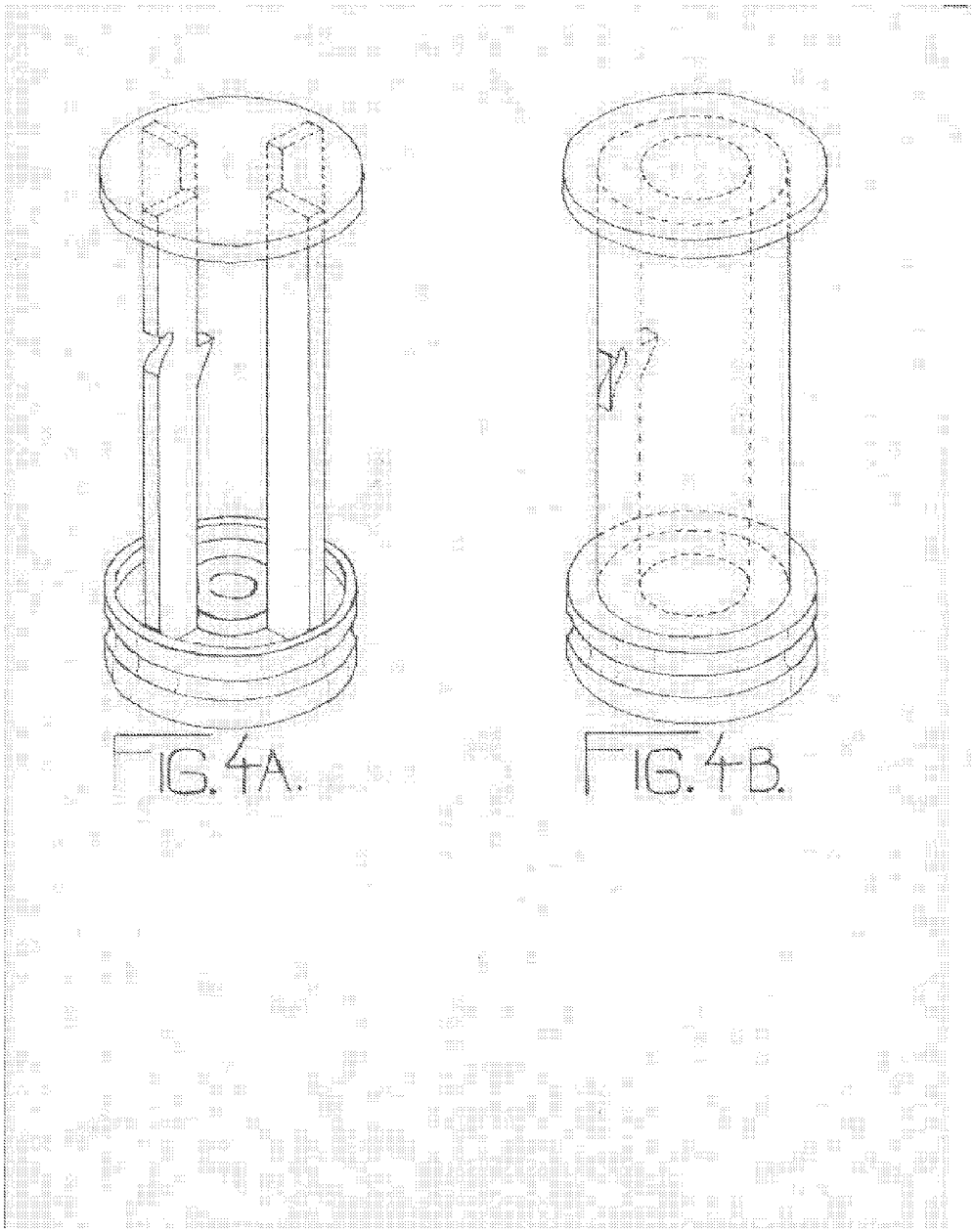

FIG. 4A.

FIG. 4B.

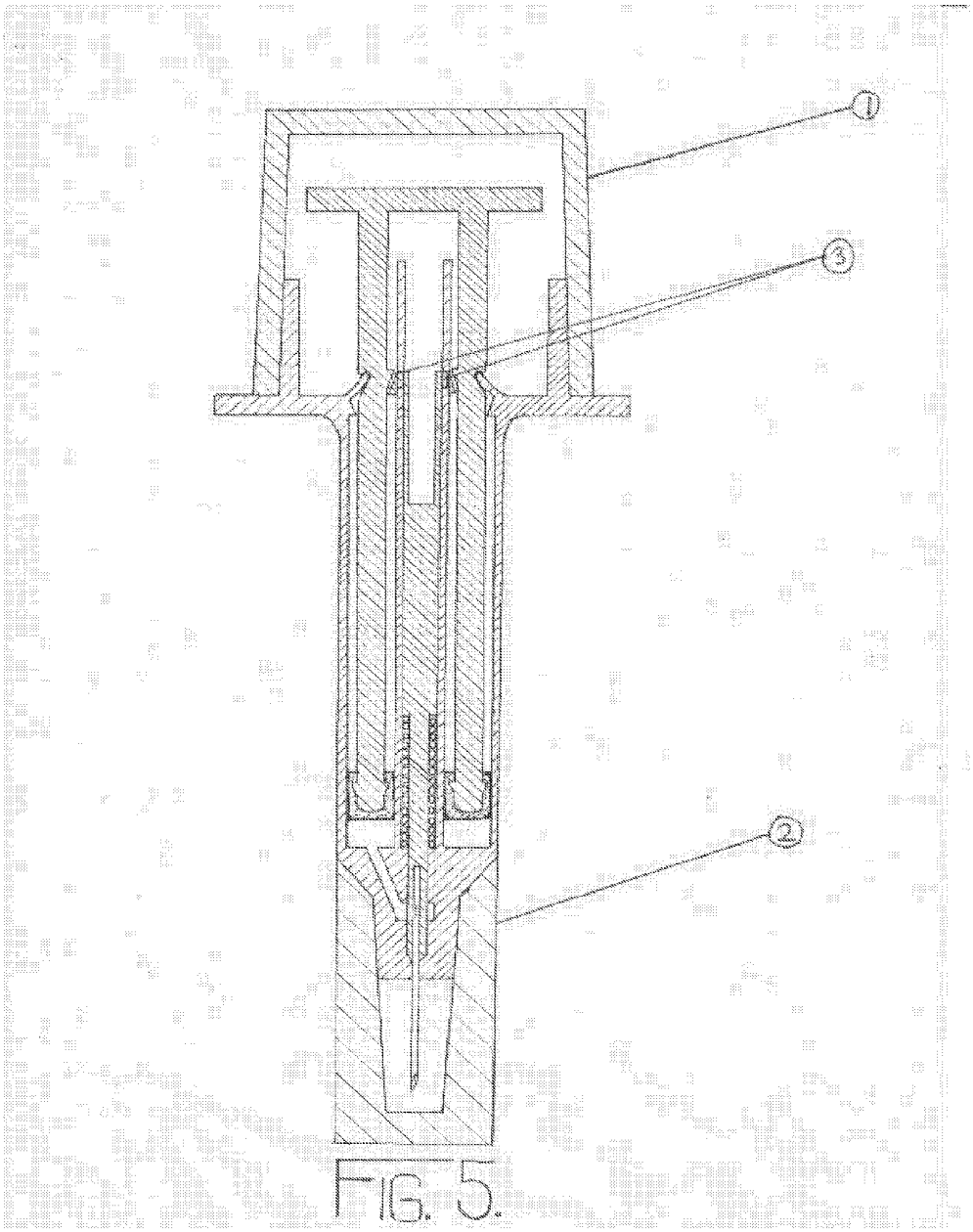

FIG. 5.